

REMARKS

Claims 1-7 remain active in the application. Claims 1 and 5-7 have been amended.
Claims 8-20 have been withdrawn from consideration.

Claims 1-7 stand objected to because of certain informalities.

In response to the above objections, Applicants have now corrected the stated informalities.

Accordingly, Applicants respectfully request that the objections to Claims 1-7 be reconsidered and withdrawn.

Claims 1-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable in view of Applicants' Admitted Prior Art [AAPA] Figure 1 in combination with Chang et al. (U.S.P. 6,696,717) [Chang].

Applicants respectfully traverse the above rejection for the following reasons:

Applicants contend that the memory cell with a vertical transistor and trench capacitor taught by Chang in combination with AAPA bears no commonality to the vertical pass transistor DRAM cell taught by Applicants.

Chang's cell teaches having three conductive layers: a) a first conductive layer 116; b) a second conductive layer 124; and c) a third conductive layer 110. Applicants submit that the dual material gate layers 12 and 13 taught by the present invention (in Figure 2) find no equivalency in the combination of AAPA with Chang. In order to clearly pinpoint the differences between AAPA combined with Chang from the structure taught by the present application, Applicants have added a drawing appended to this Amendment to clarify the differences. The enclosed drawing shows three figures:

- a) the Admitted Prior Art Figure 1 [AAPA], referred to in the Office Action;

- b) the combination of AAPA-Chang cited by the Office Action to reject claims 1-7 under 35 U.S.C. 103(a); and
- c) the structure taught by Applicants in Figure 2 of the present application, which Applicants deem to be their invention.

The combination of AAPA and Chang listed above in item b) teaches gate 1 and gate 2 made of different materials. Gate 1 is shown to be beside the spacer. The gate controlling the channel is made of one material only.

In contradistinction to AAPA-Chang, the structure taught by Applicants (listed above under item c)) teaches the gate controlling the channel comprised of Gate 2 and Gate 3 being made of two materials. Applicants submit that one skilled in the art would have no way of determining where exactly the gate material layers are to be placed within the structure combining AAPA with Chang.

Chang in his Figure 4 shows each of a plurality of gates labeled 127 (each comprised of gate 126a, gate spacer 126c and cap layer 126b) being exposed, a necessary requirement since each of the gate structures serves as a word line (see col. 3, lines 59-65). Applicants wonder how a structure having exposed gates 127 is now to be combined with AAPA, wherein the region labeled Gate 1 is fully embedded in an N+ doped polysilicon region.

Applicants submit further that, when AAPA is combined with Chang, the resultant structure fails to achieve the objectives set by the Applicants and, consequently, would be inoperable since the dual material gate 1 and 2 taught by Chang are moot regarding where exactly to place the dual materials for the gate controlling the channel. The combination of AAPA-Chang arbitrarily positions a first material in Gate 1 beside the spacer and a second material anywhere within the region above the trench top oxide layer.

2) Applicants submit further that their invention is designed to provide a method for maintaining a low total leakage current while providing sufficient current drive for the vertical DRAM pass transistor (see Summary of the present invention). Chang, on the

other hand, teaches how to prevent punch through, drain-induced barrier lowering (DIBL), and threshold voltage roll-over. Combining Chang with AAPA implies merging two incompatible structures which teaches away from the objectives set originally by Chang.

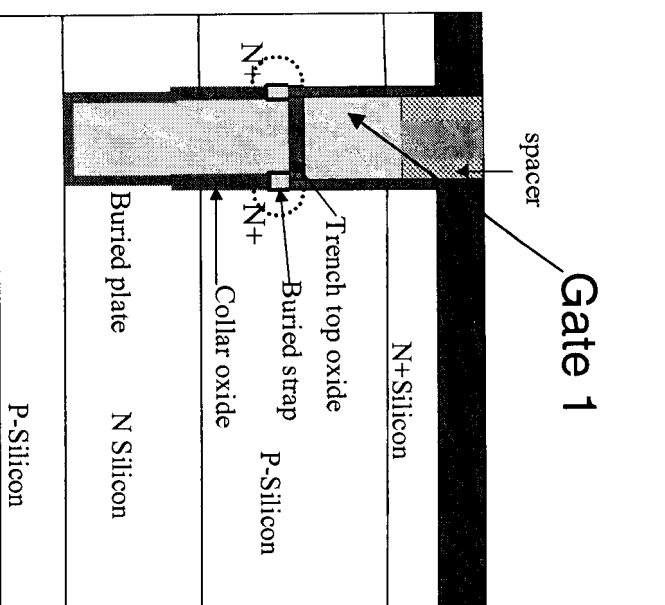
Applicants believe that they have overcome the rejection of claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over Applicants' prior art Figure 1 [AAPA] in view of Chang, and respectfully request that the Examiner reconsider and withdraw the rejection of the stated claims based thereon.

In view of the foregoing, it is respectfully requested that all the outstanding objections and rejections to this application be reconsidered and withdrawn and that the Examiner pass all the pending claims to issue.

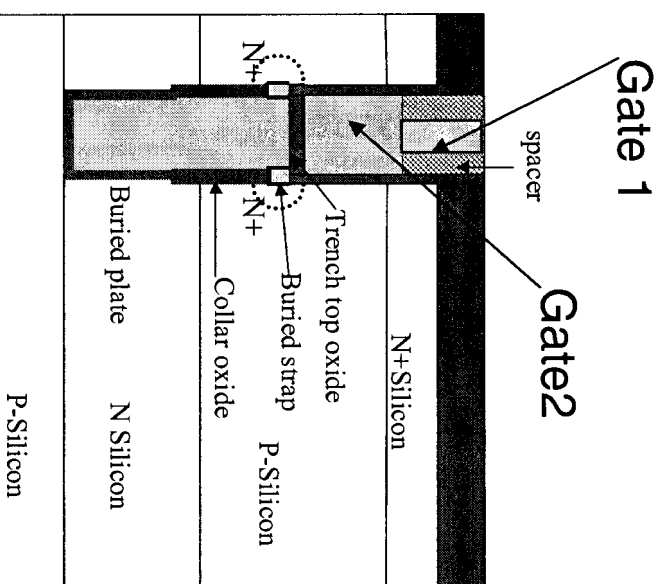
Should the Examiner have any suggestions pertinent to the allowance of this application, the Examiner is encouraged to contact Applicants' undersigned representative.

Respectfully submitted,
XIANGDONG CHEN, ET AL.

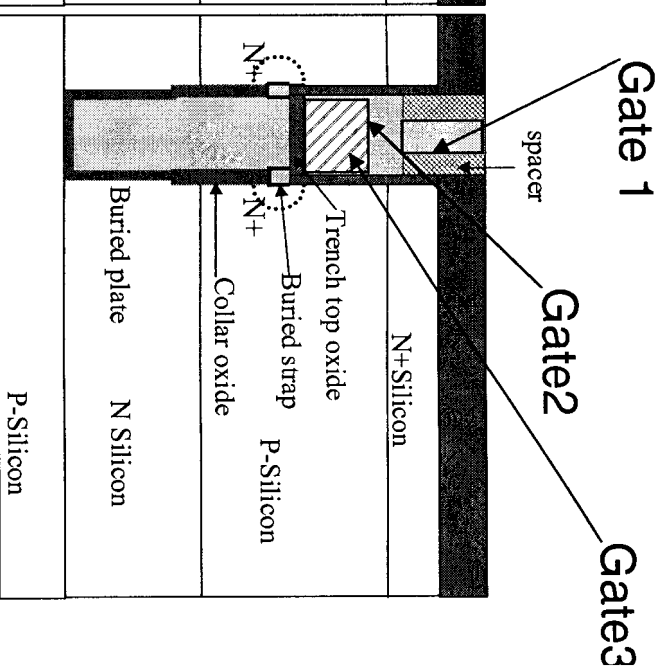
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Prior art



Prior art combined with Chang's invention: Gate 1 and Gate 2 are different materials. Gate 1 is beside spacer. The gate control the channel is one material



Structure for the current invention. The gate material control the channel is made of two materials: gate 2 and 3